CHAPTER 3

TRAVEL PATTERNS

This chapter presents the results of an origin and destination survey that was completed for DTR patrons in May 2004. This survey was designed to provide detailed information on important characteristics of the customers in addition to their origins and destinations. These characteristics included county of residence, trip purpose, trip frequency, vehicle occupancy, time saved by using the facility, reason for choosing the facility, and likelihood of choosing transit once it becomes available. The answers to these questions were used to determine the values of variables used in the modeling procedures so that future patronage of the facility under various hypothesized conditions could be estimated.

ORIGIN AND DESTINATION SURVEY ARRANGEMENTS

In order to get a good understanding of the origins, destinations and characteristics of motorists on the DTR, an origin and destination survey of the facility's patrons was conducted. Figures 3-1 and 3-2 show the actual surveys used. Figure 3-1 shows the survey that was handed out to DTR users on the facility itself, while Figure 3-2 shows the survey that was sent by mail to owners of Smart Tag.

The survey questions show the variables that were gathered. These variables are summarized in Table 3-1, along with the use(s) for each data element.

The mail-out survey was sent to patrons who were on the DTR the same day that the hand-out survey was conducted. However, they were asked about a "recent" trip rather than the one representing the day that the vehicle was seen. For that survey, two more questions were necessary. One gathered information on the time period during which the trip was made, the other on the direction that the vehicle was traveling while using the DTR for the reported trip.

Travel Pattern Survey - 2004

Dear Dulles Toll Road Customer:
Thank you for using the Dulles Toll Road and allowing us to serve you. The Virginia Department of Transportation is conducting this survey to collect information that will enable us to better serve your needs. Please complete and mail this postage-paid survey at your earliest convenience. Thank you.

A. Where did you begin this weekday trip (in this direction) today? Please be as specific as possible (e.g., nearest intersection, street address, airport, shopping malls, etc.)

_____
Street Address, Nearest Intersection or Major Landmark

_____
City County (if known) State Zip Code (if known)

B. Where did this weekday trip end (in the same direction as Question A)? Please be as specific as possible (e.g., nearest intersection, street address, airport, shopping malls, etc.) **Should not be the same as answer to Question A**

_____
Street Address, Nearest Intersection or Major Landmark

_____
City County (if known) State Zip Code (if known)

C. Where did you enter the Dulles Toll Road? (Circle one)

8. Dulles Greenway	10A. Herndon Park & Ride	13. Wiehle Ave.	16. Leesburg Pike (Rt. 7)	19. Route 123
9. Sully Rd. (Rt. 28)	11. Fairfax County Pkwy.	14. Hunter Mill Rd.	17. Spring Hill Rd.	67. I-66
10. Centreville Rd.	12. Reston Pkwy.	15. Trap Rd.	18. I-495	

D. Where did you exit the Dulles Toll Road? (Circle one)

8. Dulles Greenway	10. Centreville Rd.	12. Reston Pkwy.	15. Trap Rd.	18. I-495
9. Sully Rd. North (Rt. 28)	10A. Herndon Park & Ride	13. Wiehle Ave.	16. Leesburg Pike (Rt. 7)	19. Route 123
9A. Sully Rd. South (Rt. 28)	11. Fairfax County Pkwy.	14. Hunter Mill Rd.	17. Spring Hill Rd.	67. I-66

E. What was the purpose of this trip? (Circle one)

1. Journey To or From Work	3. Personal Business	5. Shopping	7. Social
2. Company Business	4. School	6. Recreation	

F. On average, how many times per week do you make the trip you just described? (Circle one)
Less than 1 1 2 3 4 5 or more

G. How many people, including yourself, were in the vehicle? (Circle one) 1 2 3 4 5 6 or more

H. Please identify the type of vehicle you were driving. (Circle one)

1. 2-axle vehicle (Car, SUV, motorcycle)	3. 2-axle vehicle towing 1-axle trailer	5. 3-axle truck or bus	7. 5-axle truck
2. 2-axle truck or bus	4. 2-axle vehicle towing 2-axle trailer	6. 4-axle truck	8. 6 or more axle truck

I. What best describes why you chose to use the Dulles Toll Road instead of an alternate road? (Circle One)
1. Saves Time 2. Saves Distance 3. Road Condition 4. Less Congestion

J. How much time do you think you saved by using the Dulles Toll Road? **Minutes** _____

K. Please indicate your state of vehicle registration. _____

L. Please indicate your county of residence. Use "Other" to write-in a city or county not shown here.

1. Fairfax 2. Loudoun 3. Arlington 4. Prince William 5. Montgomery 6. Prince Georges 7. Washington D.C. 8. Other_____

M. If an extension of Metrorail was made available along the Dulles Toll Road, with a park & ride lot near the home end of this trip and with other transit connections, would it be a realistic alternative for this journey? (Circle one)

1. No, it would not be possible	3. Yes, it would be possible, and I might consider it
2. Yes, it would be possible, but I would not consider it	4. Yes, it would be possible, and I would take it

N. **We will also be conducting a supplemental Internet-based survey of transportation options. If you are interested in participating in this follow-up survey, please provide your email address in the space provided below. Your participation in the follow-up Internet survey is OPTIONAL but would be greatly appreciated.**

Email Address (OPTIONAL) _____

STA.	DAY	DIR.	HR.	C	D	E	F	G	H	I	J	K	L	M	N
01		4													

SAMPLE HAND-OUT SURVEY FORM

Figure 3-1

Dear Dulles Toll Road Customer:
When responding to this survey, please think about the most recent one-way trip you made on a Monday through Friday that included the Dulles Toll Road.

A. Please indicate the time period in which you began this one-way trip. (Circle one)
1. 6:00 am to 10:00 am 2. 10:00 am to 3:00 pm 3. 3:00 pm to 7:00 pm 4. 7:00 pm to 6:00 am

B. What was your direction of travel? (Circle one) 1. Eastbound = toward Washington 2. Westbound = toward Dulles

C. Please indicate the day this one-way trip was made. (Circle one) 1. Mon 2. Tue 3. Wed 4. Thur 5. Fri

D. Where did you begin this weekday trip (in the above direction)? Please be as specific as possible (e.g., nearest intersection, street address, airport, shopping malls, etc.)

_____
Street Address, Nearest Intersection or Major Landmark

_____
City County (if known) State Zip Code (if known)

E. Where did this weekday trip end (in the same direction as Question D)? Please be as specific as possible (e.g., nearest intersection, street address, airport, shopping malls, etc.) **Should not be the same as answer to Question D**

_____
Street Address, Nearest Intersection or Major Landmark

_____
City County (if known) State Zip Code (if known)

F. Where did you enter the Dulles Toll Road? (Circle one below - See map on reverse side)

8. Dulles Greenway	10A. Herndon Park & Ride	13. Wiehle Ave.	16. Leesburg Pike (Rt. 7)	19. Route 123
9. Sully Rd. (Rt. 28)	11. Fairfax County Pkwy.	14. Hunter Mill Rd.	17. Spring Hill Rd.	67. I-66
10. Centreville Rd.	12. Reston Pkwy.	15. Trap Rd.	18. I-495	

G. Where did you exit the Dulles Toll Road? (Circle one below - See map on reverse side)

8. Dulles Greenway	10. Centreville Rd.	12. Reston Pkwy.	15. Trap Rd.	18. I-495
9. Sully Rd. North (Rt. 28)	10A. Herndon Park & Ride	13. Wiehle Ave.	16. Leesburg Pike (Rt. 7)	19. Route 123
9A. Sully Rd. South (Rt. 28)	11. Fairfax County Pkwy.	14. Hunter Mill Rd.	17. Spring Hill Rd.	67. I-66

H. What was the purpose of this trip? (Circle one)

1. Journey To or From Work	3. Personal Business	5. Shopping	7. Social
2. Company Business	4. School	6. Recreation	

I. On average, how many times per week do you make the trip you just described? (Circle one)
Less than 1 1 2 3 4 5 or more

J. How many people, including yourself, were in the vehicle? (Circle one) 1 2 3 4 5 6 or more

K. Please identify the type of vehicle you were driving. (Circle one)

1. 2-axle vehicle (Car, SUV, motorcycle)	3. 2-axle vehicle towing 1-axle trailer	5. 3-axle truck or bus	7. 5-axle truck
2. 2-axle truck or bus	4. 2-axle vehicle towing 2-axle trailer	6. 4-axle truck	8. 6 or more axle truck

L. What best describes why you chose to use the Dulles Toll Road instead of an alternate road? (Circle One)
1. Saves Time 2. Saves Distance 3. Road Condition 4. Less Congestion

M. How much time do you think you saved by using the Dulles Toll Road? **Minutes** _____

N. Please indicate your state of vehicle registration. _____

O. Please indicate your county of residence. Use "Other" to write-in a city or county not shown here.
1. Fairfax 2. Loudoun 3. Arlington 4. Prince William 5. Montgomery 6. Prince Georges 7. Washington D.C. 8. Other_____

P. If an extension of Metrorail was made available along the Dulles Toll Road, with a park & ride lot near the home end of this trip and with other transit connections, would it be a realistic alternative for this journey? (Circle one)

1. No, it would not be possible	3. Yes, it would be possible, and I might consider it
2. Yes, it would be possible, but I would not consider it	4. Yes, it would be possible, and I would take it

Q. **If you would like to participate in the supplemental follow-up Internet survey, please supply your email address below.**
Email Address (OPTIONAL) _____

A	B	C	F		G		H	I	J	K	L	M		N		O	P	Q

SAMPLE MAIL-OUT SURVEY FORM

Figure 3-2

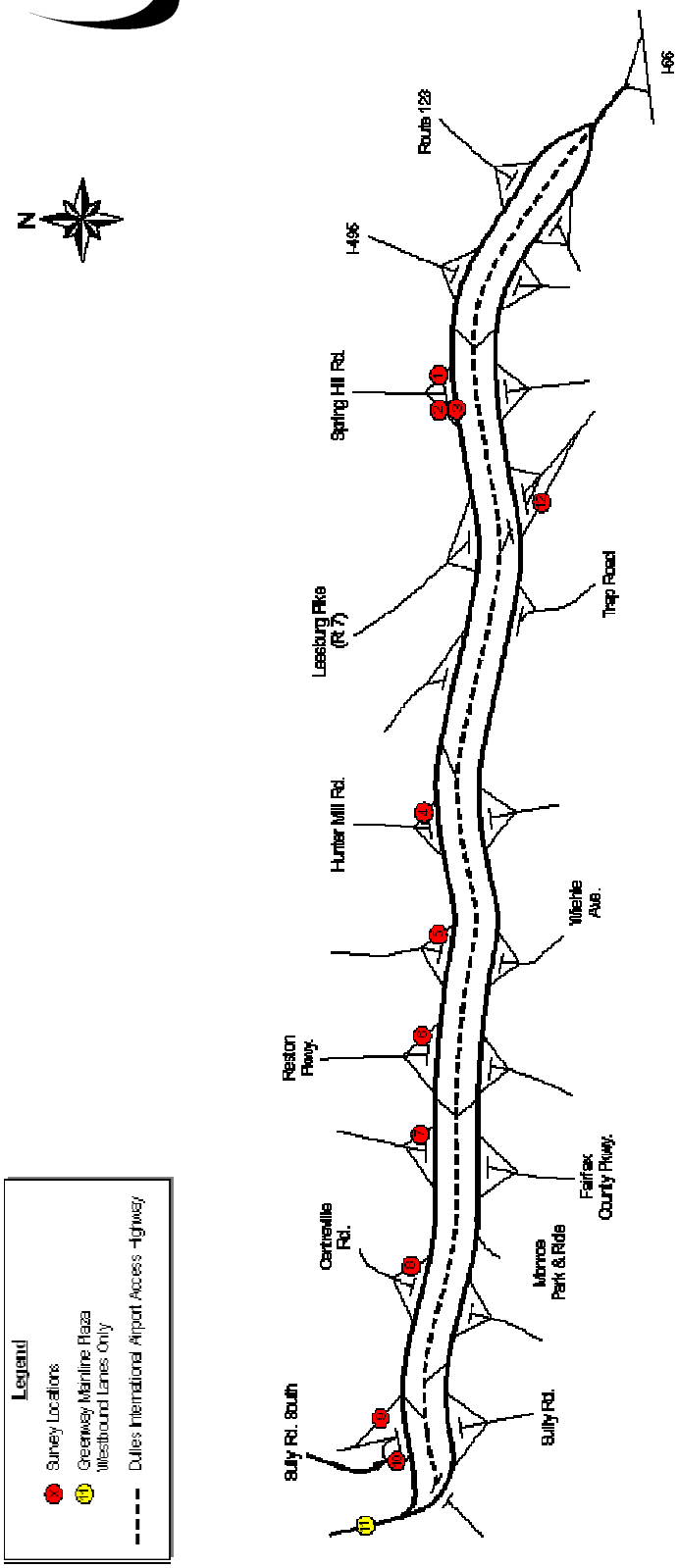
Table 3-1
Data Elements in Origin-Destination Survey

Data Element	Uses
Origin Address	Shows where the trip began
Destination Address	Shows where the trip terminated
Entry Interchange	Indicates where motorist entered the DTR
Exit Interchange	Indicates where motorist departed the DTR
Trip Purpose	Provides the reason for the trip
Days per week trip is made	Provides trip frequency
Number of people in the vehicle	Collect data on carpooling
Vehicle Type	Indicates passenger car or commercial vehicle
Reason for choosing DTR	Collect data on characteristics that attract patrons
Amount of time saved using DTR	Indicates time advantage for DTR over alternatives
Feasibility of Metrorail	Indicates whether patron may be lost to transit
State of vehicle registration	Provides indication of non-local users
County of residence	Rough location of local users
Email address	For follow-up survey on stated preference

Figure 3-3 shows a schematic of the DTR, with locations for the hand-out survey marked. In general, surveys were handed out at all westbound exits, the westbound main line plaza, and the westbound Dulles Greenway Plaza. In addition, surveys were handed out at the eastbound exit at Leesburg Pike.

Table 3-2 shows the number of hand-out surveys that were distributed at each of the hand-out locations. The table also shows the number of valid responses received from each location and the ratio that it bears to the number handed out. The average valid-response return rate for the hand-out survey was 9.8 percent, with a low of 3.7 percent at Spring Hill Road West and a high of 18.3 percent at Leesburg Pike East.

The hand-out survey was accompanied by a mail-out survey. This portion of the survey is intended to collect data from those who pay their toll using Smart Tag instead of cash. Because Smart Tag users do not stop to pay a toll, they can be surveyed only by identifying the cars that passed certain locations and sending a survey to each of them through the mail. The Smart Tag administrative staff was provided with the list of ramps and toll plazas where the hand-out survey was being conducted. They identified all the Smart Tag users who passed one of those plazas on May 18, 2004, and mailed a survey to each of them. These users were



SURVEY LOCATIONS

Figure 3-3

Table 3-2
Survey Response Statistics

Cash Transactions Table (hand-Out Survey):

Station Number	Route	Direction	Survey Period	Location	Cards Distributed	Cards Returned	Valid Survey Responses	Return Rates for Total Responses	Return Rates for Valid Responses
1	Capital Beltway (Spring Hill Rd. E)	WB Off Ramp	5/18, 0630-1830	Exit 17 (RT 684)	3,207	603	463	18.8%	14.4%
2	Spring Hill Road West	WB On Ramp	5/18, 0630-1830	Exit 17 (Rt 684)	1,500	85	56	5.7%	3.7%
3	Mainline (Spring Hill Rd)	WB	5/18, 0630-1830		15,782	1,598	1,279	10.1%	8.1%
4	Hunter Mill Road	WB Off Ramp	5/19, 0630-1830	Exit 14 (Rt 674)	1,390	197	155	14.2%	11.2%
5	Wiehle Ave	WB Off Ramp	5/19, 0630-1830	Exit 13 (Rt 828)	2,489	437	349	17.6%	14.0%
6	Reston Pkwy	WB Off Ramp	5/19, 0630-1830	Exit 12 (Rt 602)	5,027	674	546	13.4%	10.9%
7	Fairfax Pkwy	WB Off Ramp	5/19, 0630-1830	Exit 11 (Rt 7100)	5,281	947	739	17.9%	14.0%
8	Centreville Road	WB Off Ramp	5/20, 0600-1800	Exit 10 (Rt 657)	4,095	482	406	11.8%	9.9%
9	Sully Rd North (Route 28)	WB to NB Off Ramp	5/20, 0600-1800	Exit 9B (Rt 28)	4,390	320	243	7.3%	5.5%
10	Sully Rd South (Route 28)	WB to SB Off Ramp	5/20, 0600-1800	Exit 9A (Rt 28)	2,971	355	299	11.9%	10.1%
11	Dulles Greenway MLP	WB	5/20, 0600-1800	Main Toll Plaza	2,390	145	123	6.1%	5.1%
12	Leesburg Pike (Rte 7)	EB Off Ramp	5/20, 0600-1800	Exit 16 (Rte 7)	4,317	977	790	22.6%	18.3%
TOTAL					52,839	6,820	5,448	12.9%	9.8%

Smart Tag Survey Results (Mail Out Survey):

Surveys Distributed	Surveys Returned	Valid Surveys	Return Rates for Total Resp	Return Rates for Valid Resp
48,252	**8,100**	**6,716**	**16.8%**	**13.9%**

requested to report on their *most recent* trip on the DTR, as opposed to the trip where their presence was detected. Because the reporting is not on the same basis as the hand-out survey, a response rate by plaza cannot be computed for these respondents. For that reason, only a total response rate can be reported. Of the 48,252 mail-out surveys distributed, 6,716 valid ones were received, for a response rate of 13.9 percent.

A combined total of the hand-out and mail-out surveys distributed amounted to 101,091. Returned surveys consisted of responses where all the data could be interpreted in a valid way and were reported earlier to get an understanding of the valid response rate. In addition, many responses were processed, but for one reason or another did not contain sufficiently valid information to be included. Adding both valid and invalid returns, there were 14,920 of them returned for further processing. This total response rate of 14.8 percent compares well with the usual range of 10 to 20 percent.

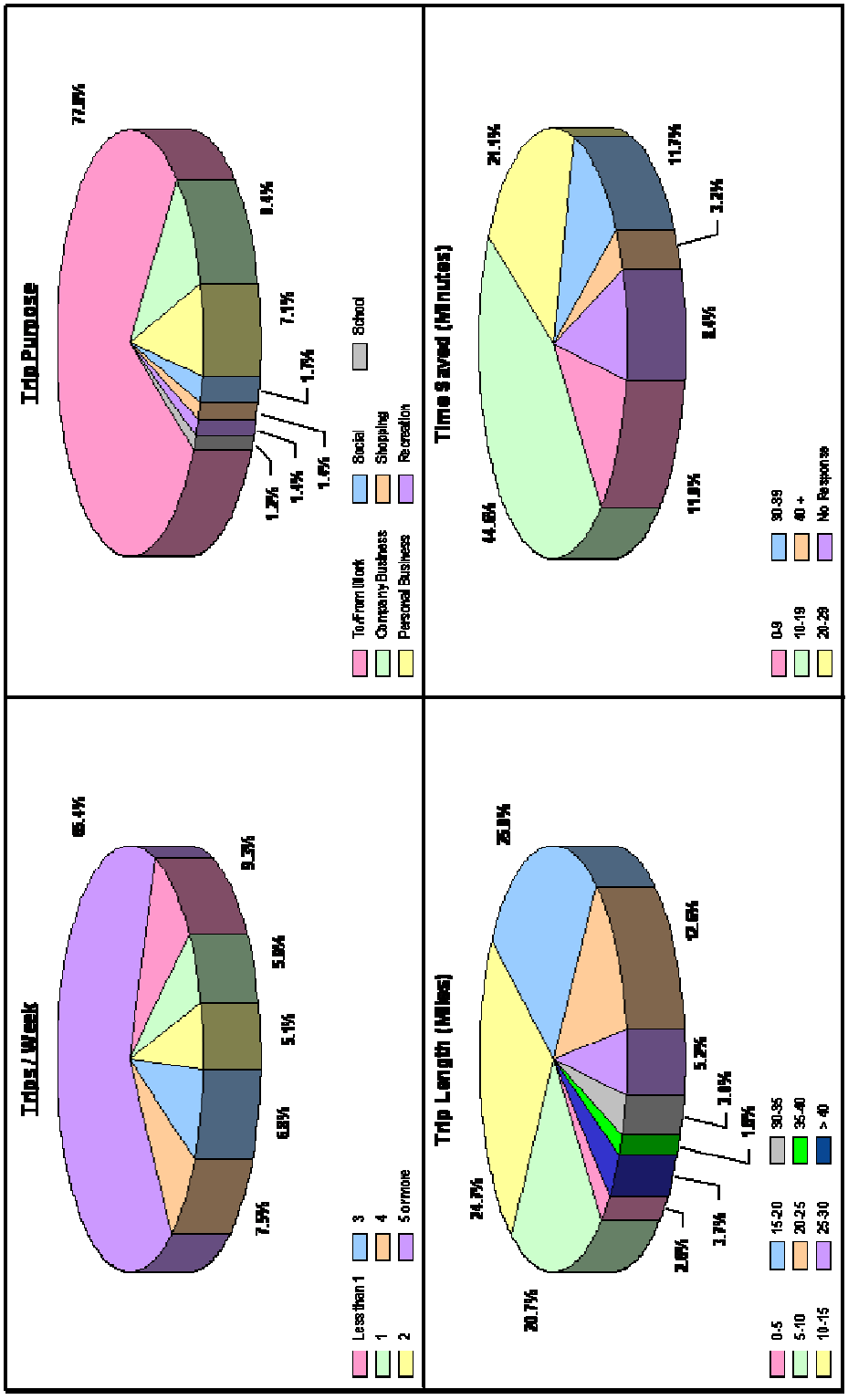
TRIP CHARACTERISTICS

Figures 3-4 and 3-5 show seven pie charts developed from the survey's data. These include the following:

- Trips per Week (Trip Frequency). Almost two-thirds of the respondents answered that the trip being surveyed occurs five or more times per week. The remaining respondents were split almost evenly among the other trip frequency choices.

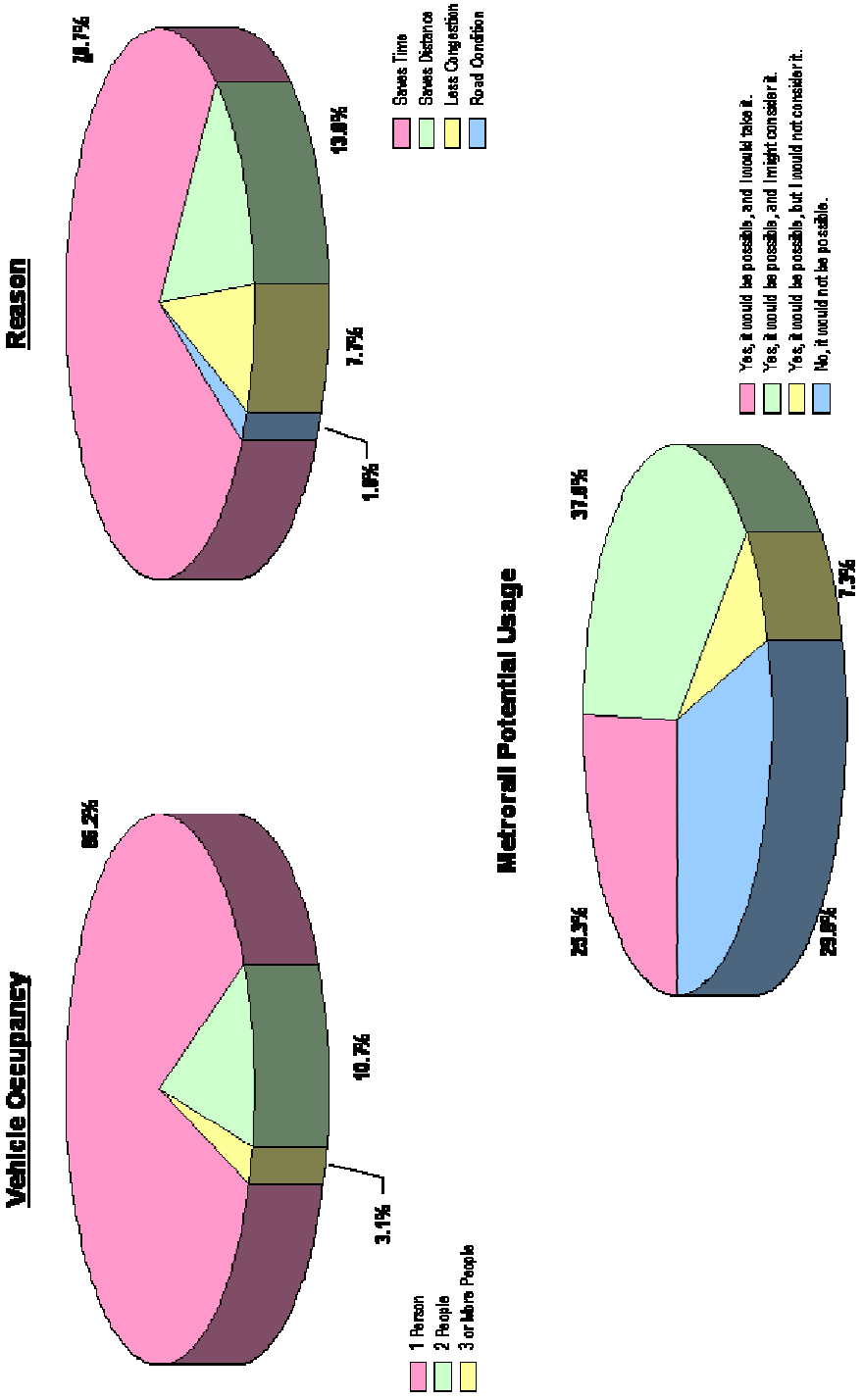
- Trip Purpose. Each respondent was requested to provide the reason for having made the trip during which they had received the survey card. As the pie chart shows, over 77 percent of the respondents were using the facility for a journey to or from work. Nearly 10 percent, or almost half the remaining respondents, were traveling on business unrelated to their commute. The remaining 13 percent of respondents reported trip purposes split among, social, recreational, shopping, school, and personal business.

- Trip Length (miles). The majority of DTR users (52 percent) have selected the facility as part of a trip whose distance is more than 15 miles. Only 2.6 percent are traveling fewer than 5 miles and 45 percent are traveling 5 to15 miles.



ORIGIN - DESTINATION SURVEY DATA

Figure 3-4



ORIGIN - DESTINATION SURVEY DATA

Figure 3-5

- Time Saved (on the DTR). When asked how much time the DTR saved, 36 percent of the respondents indicated that the amount was more than 20 minutes and 45 percent indicated that it was less than that. Only 11 percent of the respondents indicated that the DTR would save them less than 10 minutes.

- Vehicle Occupancy. The vast majority of DTR users (more than 86 percent) are the only occupants of their vehicles. Of the remaining 14 percent of respondents, 11 percent are in cars with only two persons. Only 3 percent of vehicles contain three or more occupants.

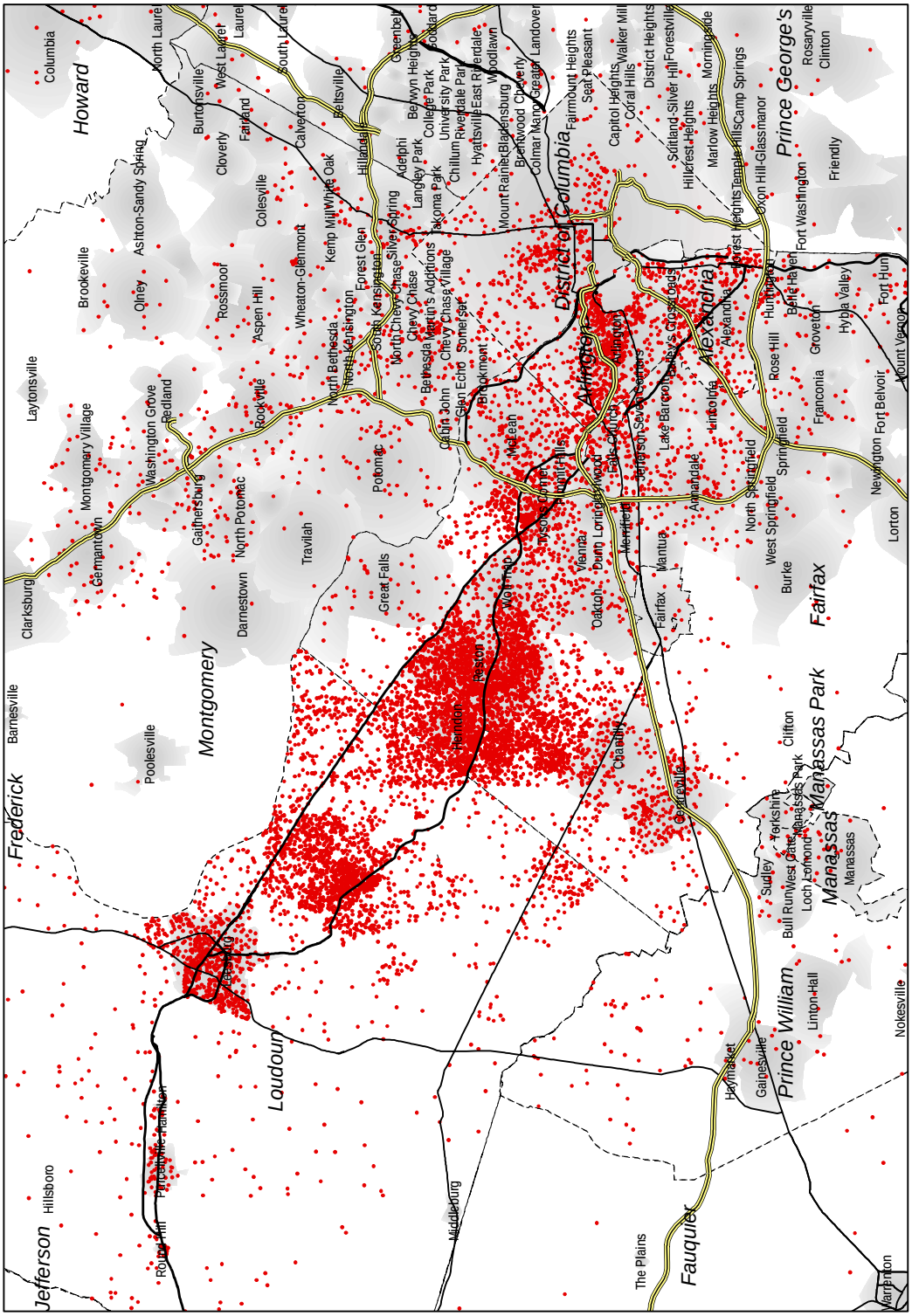
- Reason (for using the DTR). More than three-fourths of the respondents indicated that they selected the DTR over other routes because the DTR saves time.

- Metrorail Potential Usage. Nearly 63 percent of respondents indicated that they would or probably would use Metrorail for their trip if available. The remaining 37 percent indicated that the rail is either infeasible or a choice that they would not make. Nevertheless, this response indicates that there could be a large number of DTR customers that may choose Metrorail once that choice becomes available.

The last question on each of the surveys was optional. Users were provided the opportunity to list an email address if they had a desire to participate in a follow-up survey regarding the modeling of their preferences. This would increase the number of potential respondents for the SP survey being conducted as part of this effort. On average, over 20 percent of the respondents provided an email address.

PATTERNS OF SURVEYED TRIPS

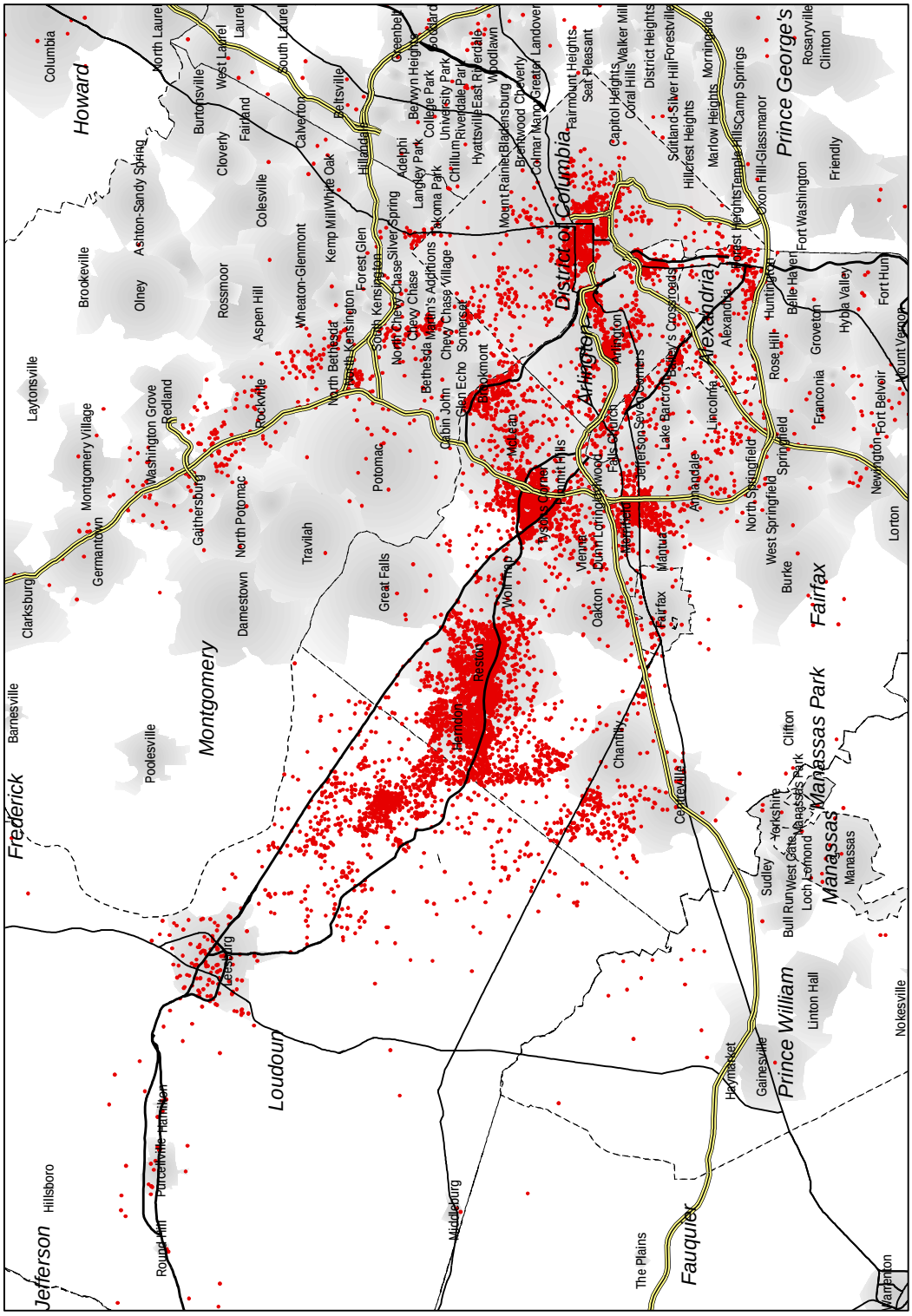
The evening peak pattern for the surveyed trip destinations and origins is shown in Figures 3-6 and 3-7. These figures are each a dot-density chart. A chart of that type has an advantage over one which shades traffic zones in that the latter can be misleading. Zones which contain a large number of trips but also cover a large geographic area may appear to be contributing more to the matrix than they actually do. A dot-density map places a uniformly sized dot that represents a fixed number of trips at a random location within the zone where the trip originates or terminates. When viewed as shading, the map shows heavier shading where the



Note: One red dot equals five trip origins.

PM PEAK DESTINATIONS

Figure 3-6



Note: One red dot equals five trip origins.

PM PEAK ORIGINS

Figure 3-7

density of trips is heaviest. The geographic zones used in this case were the transportation analysis zones (TAZs).

Figure 3-6 provides the pattern of destinations and Figure 3-7 provides the pattern of originations for all motorists using the facility in the PM peak period. In this case, it represents sums of trips taken by respondents who received a card at any of the hand-out locations other than the Leesburg Pike exit, plus, those of the mail out survey where the respondent indicates that the trip being described was westbound on the facility during the afternoon peak.

In the PM peak period, travel on the DTR facility is dominated by commuters returning home from work. For that reason, the pattern of origins would be dominated by work site locations and the pattern of destinations would be dominated by home locations. As Figure 3-6 shows, destinations (home sites) are more scattered than origins (work sites). With the destinations denser at the west end than at the east end, commuters tend to live in Loudoun County or western Fairfax County more frequently than in Arlington, Washington, DC, or Maryland.

Figure 3-7, the origins map shows a pattern that is more typical of work site locations. The clustering is denser and the locations tend to be more on the east side than on the west side. For example, Figure 3-7 shows a very dense set of trip origins in downtown DC, Tysons Corner, and the western half of the DTR. These all represent major employment centers for DTR patrons, work sites where DTR patrons will begin their trips in the afternoon peak. Virtually no peak trips have origins in Loudoun County. According to Figure 3-6, a lot of PM peak trips end their journeys in Loudoun County, a western residential area for many whose jobs lie to the east. Further, all the dots in Figure 3-6 are further apart than those in Figure 3-7, showing that places of employment sites are generally more closely packed together than places of residence.

MERGING THE ORIGIN-DESTINATION TABLE INTO THE TRIP TABLE

Following clean-up and screening, the survey data at each station was expanded to represent the total volume for an average weekday at the station. Expansion factors were developed by direction and time period (AM peak, PM peak, off-peak) for each station. The origin-destination survey results were merged in with synthetic trip tables that were developed for the DRPT's most recent Metrorail ridership analysis. This

merger allows the trip tables to reflect actual travel patterns of DTR users. The merging process involved the following steps:

- Run initial traffic assignment at base year levels using synthetic trip tables;
- Extract selected link trip tables of traffic assigned to DTR survey stations (by direction and time period);
- Aggregate trip end data from surveys to superzone levels. (Superzones are districts composed of many TAZs. There were 56 superzones in this effort – and they were smaller near the DTR and larger far from it.);
- Aggregate trip end estimates from selected link trip tables to superzone levels;
- Compare and develop adjustment factors at the superzone level to reflect the travel patterns from the survey data;
- Adjust select-link trip tables using factors for corresponding superzone pairs; and
- Replace adjusted selected link trip tables into the regional trip tables.

This merging would provide a useful trip table against which to conduct the base year toll rate sensitivity analyses. For long-term growth forecasts, the trip tables that were developed based on assumptions related to growth in socioeconomic variables and the future transportation network may provide a more reliable picture of future travel patterns, particularly in areas of high growth, since those movements would not have been captured through base-year surveys. For that reason, the use of the survey travel patterns for the model's travel patterns was phased out gradually over time. For this study, no survey patterns were substituted for the 2020 forecast.

STATED PREFERENCE (SP) SURVEYS

One of the many inputs required for understanding traveler behavior and thereby developing revenue estimates for a toll facility is the drivers' value of time. Within the modeling process, travel times are estimated on competing non-tolled facilities and compared with the travel time on the tolled facility for various travel movements (origin-destination pairs).
The portion of the corridor travel demand comprising motorists willing to pay for the calculated time savings is then allocated to the toll facility. From this, traffic and toll revenue estimates are calculated for the tolled facility. These estimates of traffic are produced within an iterative equilibrium assignment process, to incorporate the effects of congestion on traveler route choice. Critical to this process is the ability to estimate

the amount of money that members of the travel demand cohort would be willing to pay for a given amount of time savings. This "value of time" may be derived from the analysis of SP surveys conducted within the corridor.

In addition to revenue sensitivity to toll increases, VDOT requested that the future revenue impacts of a proposed rate structure incorporating discounted Smart Tag tolls be analyzed. It is assumed that this would provide an incentive for DTR customers to acquire a Smart Tag, thereby increasing the total percentage of drivers owning and using a Smart Tag. The willingness of cash-paying customers to switch to Smart Tag under various incentive policy scenarios has also been measured here using a SP survey instrument. The ensuing sections of this report summarize route, payment and mode choice experiments that were conducted. In addition, information concerning the procedures used to estimate the values of time and the propensity to acquire a Smart Tag are provided.

SP SURVEY ADMINISTRATION PLAN

For the present study, SP surveys were conducted at a wide variety of locations within Fairfax County, Virginia over a period of seven days, from May 19th through May 26th, 2004. In order to give individuals of different income levels, ages, and ethnicities the opportunity to participate, the study was conducted at locations that attract different types of people, such as the Ballston Common Mall, the Herndon Community Center, Friday Night Live (a musical event in Herndon), and the Department of Motor Vehicles in both Tysons Corner and Sterling.

In addition to the 616 surveys collected onsite in Arlington and Fairfax Counties, surveys were also collected over the internet at SurveyCafe.com, RSG's online web survey site, between May 24th and June 21st. Of these, 694 were recruited by e-mail from a sub-sample of respondents to an origin-destination study conducted shortly before this SP survey. Users representing Loudoun County were included among the shoppers intercepted at Tysons Corner. In addition, the e-mail addresses procured from DTR users during the OD survey contained many Loudoun County residents. Flyers handed out at the Reston Regional and Herndon Fortnightly branches of the Fairfax County library system encouraged 121 individuals to log on and complete the survey. Finally, an e-mail introducing the survey and providing a clickable hyperlink to it was sent to appropriate employees of Marymount University, of whom 15 completed the survey.

For the SP survey, only current users of the DTR were declared eligible to participate. If the objective of this study were to evaluate the effectiveness of transportation solutions other than the DTR, or to evaluate the extent to which the DTR could increase its ridership by lowering tolls, then it would be appropriate to determine the travel patterns and characteristics of other travelers in the corridor. However, the purpose of this study related only to the bonding capacity associated with upward adjustments of tolls on the DTR. The only expected output of this study was incremental revenue associated with a number of alternative toll rate schedules.

SP SURVEY QUESTIONNAIRE

The SP survey was comprised of four main sections:

- Respondent Screening;
- Trip Information;
- Smart Tag Acquisition (for cash-paying respondents only); and
- Travel Choice.

These sections are discussed in greater detail in the following sections.

RESPONDENT SCREENING

The present study is primarily concerned with assessing the likely behavioral responses of current DTR users to rate structure modifications. Therefore, the "universe" from which the SP survey sample was drawn was considered to be the population of people currently using the DTR. Those respondents recruited from the origin-destination survey sample were, by virtue of their intercept recruitment for that survey, essentially guaranteed to be DTR users. Not all respondents recruited from within the corridor via other means would necessarily use the DTR, however, a simple preliminary set of questions was asked to determine whether the potential respondent belonged in the universe of DTR users.

TRIP INFORMATION

Details concerning respondents' trips were gathered for two purposes. First, this information was used to evaluate the possibility of bias in the survey sample, by comparing such attributes as trip end-points, departure time and purpose with data from other sources, such as traffic counts, origin-destination surveys, and prior studies. Trip information data was

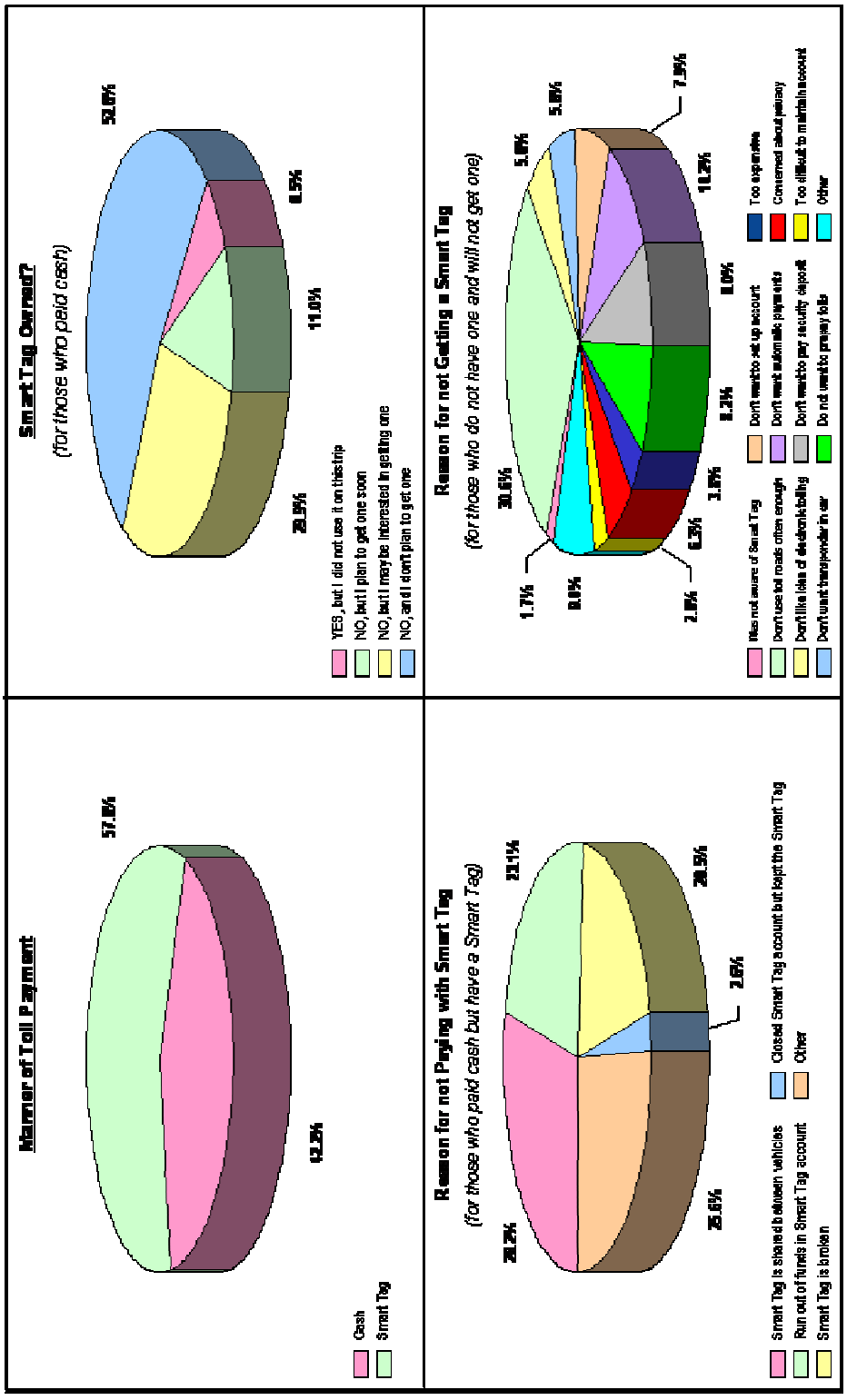
also used as an integral part of the survey's design and logic: parameters of questions in subsequent sections of the survey were varied based on the responses to these questions, to ensure a realistic frame of reference for hypothetical travel options. Web scripts embedded within the survey form automatically validated these responses, to catch and prevent respondent errors and outliers.

SMART TAG ACQUISITION

Some of the rate modification policies to be tested incorporate various incentives for Smart Tag acquisition and use. To help assess the potency of these incentives, a special section of the survey included questions regarding Smart Tag use. Figure 3-8 graphically summarizes responses to some of these questions. Just over 50 percent of survey respondents indicated that they paid tolls using a Smart Tag, consistent with recent data collected on the DTR.

Of those who paid cash, over half said that they had no plans to acquire a Smart Tag, and 6.5 percent said that they owned a Smart Tag, but simply did not use it on the reported trip (a not-too-surprising result as there is no discount offered when paying with a Smart Tag). About half of these respondents indicated that situational constraints such as lack of funds or temporary lack of access to their household's Smart Tag prevented them from using it on the reported trip, but more than a quarter of respondents indicated an "other" reason for this choice, suggesting that perhaps plaza operations may play a critical role in determining Tag use, separately from acquisition.

For example, many of the users who currently pay with Smart Tag remain in the queue of cash-paying customers. They do this because motorists who use the Smart Tag lane at the main plaza (either eastbound or westbound) and wish to exit at the first interchange thereafter must cross many lanes of weaving customers who have just left the toll booths after paying cash. It appears that most motorists believe this maneuver is too unsafe to be worth the few minutes saved by completing the transaction with Smart Tag. This observed pattern suggests that failure to institute any formal policy providing incentive for Smart Tag use may make it difficult for certain users to justify acquiring and using Smart Tag. In other words, under conditions of increasing plaza failure and congestion, the already slight time savings benefit enjoyed by Smart Tag users will be eroded. In this case, fewer cash patrons would acquire Smart Tags, and current Smart Tag owners may allow more time to go by before replenishing their account.



SMART TAG

Figure 3-8

Those respondents without plans to acquire a Smart Tag listed a variety of reasons for this decision. Foremost among these, 30.6 percent indicated that they did not use toll roads often enough, confirming the result found in other studies that trip frequency is correlated with ETC program participation. Most other respondents took issue with fundamental aspects of the Smart Tag program. For example, 10.2 percent said that they did not want automatic payments, 8.2 percent said that they did not want to prepay tolls, 8.0 percent said that they did not want to pay the security deposit, and 7.9 percent said that they did not want to set up an account.

In addition to the attitudinal questions discussed above, each respondent was also presented with 8 of 16 possible hypothetical scenarios involving the implementation of one or more of the following policies, with each policy having multiple "levels:"

- Smart Tag replenishment by automatic credit card charge, telephone authorization, or online (Web) purchase;
- Minimum replenishment amount of $20, $35, or $50;
- Smart Tag deposit amount of $30, $15, or zero (none required);
- Smart Tag Toll discount of 10%, 20%, or 30%; and
- Toll collection via Express Lanes (versus the status quo configuration).

Under each hypothetical scenario, cash-paying respondents were asked to indicate whether or not they would obtain a Smart Tag. These responses were used to develop binomial logit models of Smart Tag acquisition for commuter, business, and other travel segments. Such models have been incorporated into the traffic and revenue estimates for scenarios involving discounted Smart Tag tolls, and, could similarly be employed to assess the impacts of other Smart Tag scenarios upon traffic and revenue.

Key findings from the logit analysis include the following:

- Website replenishment was the most attractive option for commuter and business travel market segments, while all other segments preferred automatic credit card replenishment. However, the specific replenishment method offered was found not to significantly affect the overall attractiveness of Smart Tag acquisition;
- For most travelers, the presence or absence of a required deposit affects Smart Tag acquisition more significantly than the exact deposit amount;
- Willingness to acquire a Smart Tag increases with the amount of discount offered to Smart Tag users, as expected; and
- Preference for Express Lanes was more significant for commuters than for business or any other travel segment.

As noted above, the only scenario evaluated here is a modified rate structure incorporating a toll discount for Smart Tag users.

TRAVEL CHOICE

All respondents (regardless of payment mode) completed a series of choice experiments in which they were presented with alternative travel options for the trip they had described earlier in the survey. Web programming was used to generate alternative scenarios, as in the "Smart Tag Acquisition" section. Each respondent was presented with 8 out of 64 possible scenarios. Each experiment offered up to five alternative ways to make the trip described in the "Trip Information" section. The alternatives were presented in different arrangements from survey to survey (although presentation was consistent throughout the eight scenarios seen by each respondent to minimize confusion) to remove any likelihood of ordering effects.

Trip characteristics varied to produce these scenarios, including the following:

- General purpose (GP) lane travel time
- GP lane toll cost
- Time-shifted trip travel time
- Time-shifted trip toll cost
- Amount of trip departure time shift
- Direction of trip departure time shift
- HOV lane travel time
- HOV lane toll cost
- Toll-free route travel time
- Transit access mode and travel time
- Transit in-vehicle travel time
- Transit fare
- Transit wait time
- Transit egress time.

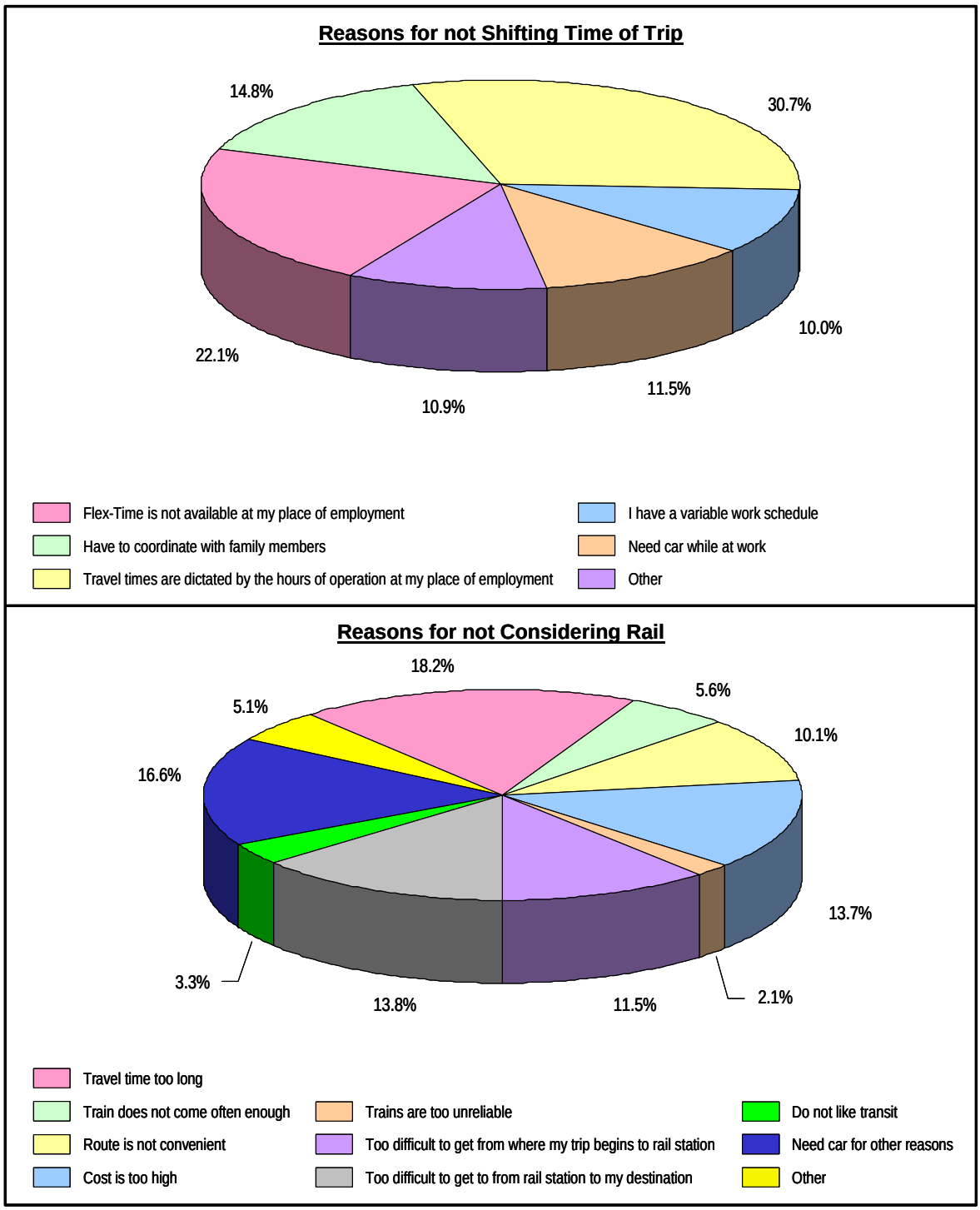
The general alternatives shown were as follows:

1. *DTR, Same Time as Current Trip* – always shown, although if the respondent was traveling in the direction and time frame of HOV Lane operation in a vehicle with more than one occupant, the times and tolls from the HOV alternative were substituted and the HOV alternative was not presented.

2. *DTR, Different Trip Time* – shown only for trips taking place during peak hours (any part of the trip occurring between 6:30 and 8:59 AM or 4:30 and 6:59 PM on a weekday).
3. *DTR, HOV Lane* – shown only to travelers in SOVs who traveled during peak hours in the direction that HOV Lanes operate (eastbound in the morning, westbound in the afternoon).
4. *Non-Tolled Route* – always shown, with a hypothetical travel time calculated based upon reported travel times on the DTR and the next-best route.
5. *New Rail Service* – shown to respondents making trips that would be transit-accessible at the origin and destination end, following a route where transit was deemed to be a reasonable option.

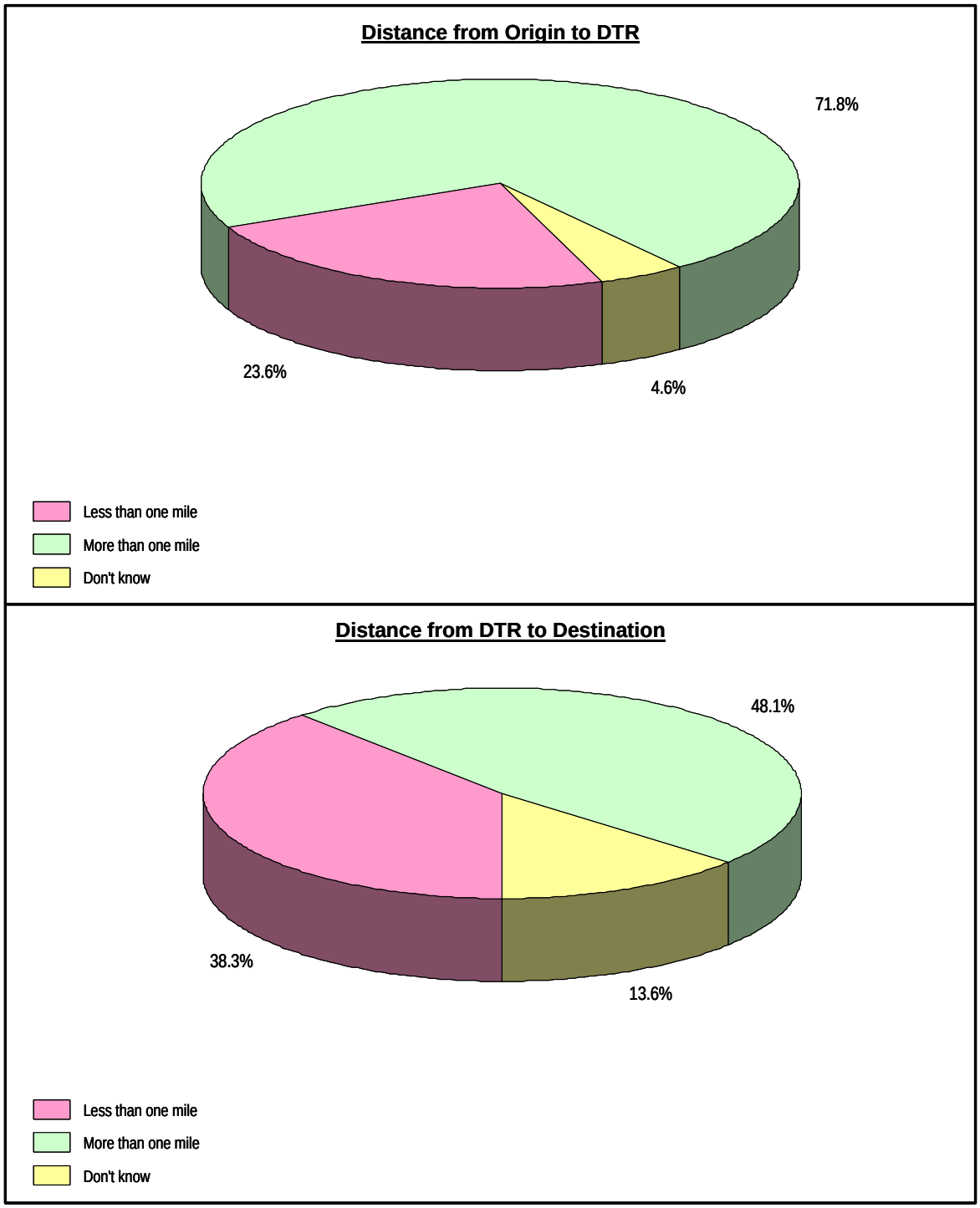
Following the eight SP experiment questions, respondents who were offered Alternative 5 (New Rail Service) but never selected it were asked why they never chose that option. Figure 3-9 depicts the distribution of responses to this question, as well as the distribution of responses to similar debrief questions, asked if respondents were offered but never chose Alternative 2 (Different Trip Time). A plurality of respondents (30.7 percent) said that their travel times were dictated by the hours of operation at their place of employment, and most other responses to this question similarly indicated the presence of some social or institutional constraint on departure time. A wide variety of reasons were cited for not considering rail, including that the proposed travel time would be too long (18.2 percent), that a car would be needed for other reasons (16.6 percent), that it would be too difficult to get from a rail station to the trip destination (13.8 percent), and that the cost would be too high (13.7 percent). This issue of transit accessibility is addressed further by Figure 3-10, which shows responses to questions regarding the distance of reported trip origins and destinations to and from the DTR, which would follow closely the alignment of the proposed rail extension. Almost half of the reported trips had destinations further than one mile from the DTR, and 71.8 percent had trip origins more than one mile away. Thus, although the two systems would follow identical alignments, they do not necessarily compete for the same travel cohort, in that DTR trips generally originate and terminate further away from the DTR than would be expected for a rail transit trip.

Finally, several general demographic questions were asked to allow demographic variables to be included during model estimation and to assist the application of the model to different population segments. The demographic questions included household size, number of vehicles, age,



REASONS FOR NOT TAKING CERTAIN ACTIONS

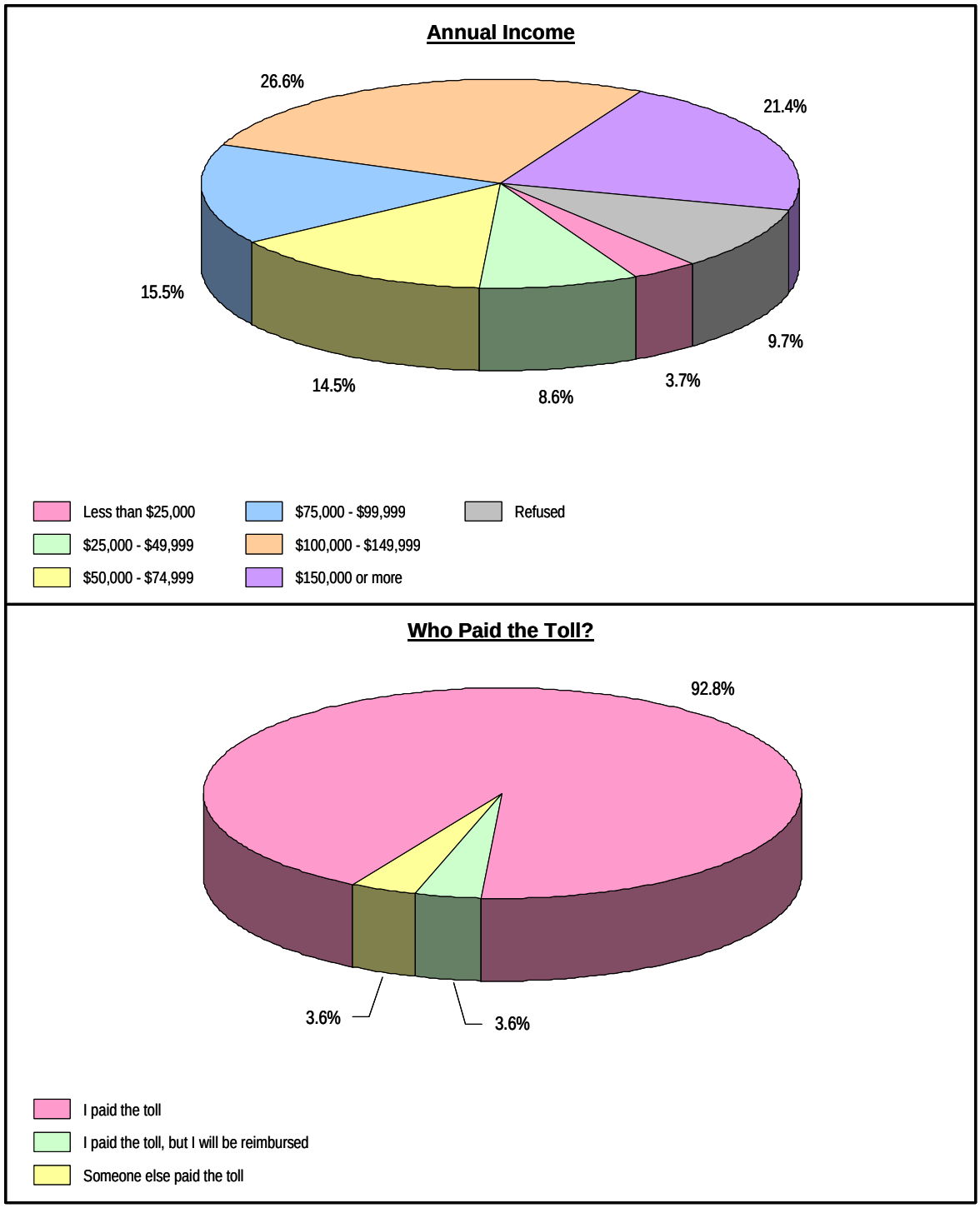
Figure 3-9



DISTANCE FROM THE DTR

Figure 3-10

gender, employment status, and annual household income. The stated distribution of annual incomes in the sample is shown in the top half of Figure 3-11. This distribution is highest in the $100,000 to $149,999 range, reflecting the relatively affluent nature of the travel cohort using the DTR. The implicit association of traveler income with willingness-to-pay is not undermined by the effects of workplace travel reimbursement or similar transactions; 92.8 percent of survey respondents paid their own tolls on the reported recent trip.



OTHER DATA

Figure 3-11